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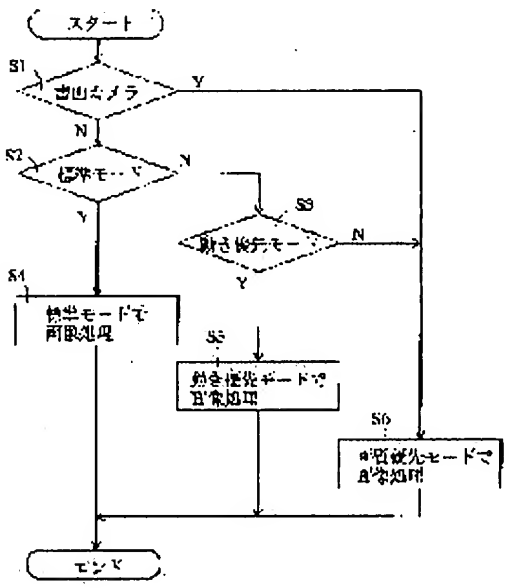
(54) PICTURE ENCODER

(57)Abstract:

PURPOSE: To send a still picture in high picture quality and to reduce a load required therefor.

CONSTITUTION: When a document camera is selected (S1), a picture is processed (coded) in the picture quality priority mode independently of the setting by the user (S6). When the document camera is not selected (S1), the picture is processed in the standard mode (S4) decording to the setting by the user when the standard mode is set (S2), or the picture is processed in the motion priority mode (S5) when the motion priority mode is set (S3), or the picture is processed in the picture quality priority mode (S6) when the picture quality priority mode is set (S6).



LEGAL STATUS

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application converted registration]

[Date of final disposal for application]

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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] More specifically, this invention relates to a TV phone or the image coding equipment for the pictorial communication of a television conference about image coding equipment.
[0002]
[Description of the Prior Art] It may not become but records (still picture), such as a graph and a graphic form, may be transmitted. in a video conference system, a board participant's photography image (dynamic image) is transmitted -- as a transmitting mode or coding mode The image quality priority mode which gives priority to the image quality other than the canonical mode in consideration of both image quality (space resolution) and the flattery nature (time amount resolution) to a motion, It has the motion priority mode which gives priority to motion flattery nature, and the terminal unit with which users (board participant etc.) enabled it to choose these according to a user's palatability or the property of an image is also proposed.
[0003] In addition, the inside of a screen and coding between screens, a quantization property, a frame rate, etc. are determined by to which of flattery nature it moves with image quality and priority is given.
[0004] For example, although image quality will improve if quantization step size is finely set up about a quantization property, significant data increase and the number of transmitted bits increases. On the contrary, although the amount of transaction datas will decrease if quantization step size is set up greatly, image quality deteriorates. Moreover, according to CCITT advice H.261, there is an upper limit in the number of bits generated in case one frame is encoded, and there is a limitation also in an improvement of the quantization property for highly-minute-izing of an image. If degradation of the image quality over a motion is also taken into consideration, it is necessary to control a frame rate (for example, drop [piece]).
[0005] Highly minute-ization of image quality means the increment in the number of transmitted bits, and leads to reduction in a frame rate. By moving with image quality (space resolution), if flattery nature (time amount resolution) conflicts and high definition is pursued, it will move inevitably and flattery nature will get worse.
[0006] Since it is troublesome that a user chooses coding mode each time according to whether a still picture is transmitted for whether a dynamic image is transmitted, the property (a still picture, an animation, scene change scene, etc.) of an input image is investigated before coding, and the image coding equipment which chooses coding mode accommodative is proposed.
[0007]
[Problem(s) to be Solved by the Invention] However, in the conventional example which chooses coding mode accommodative, when the camera which photos records, for example is swaying, there is a fault of encoding the input image from the camera concerned in the coding mode which gave priority to the motion. That is, it will have misunderstanding with a dynamic image.
[0008] This invention aims at showing the image coding equipment which canceled such inconvenience.

[0009]
[Means for Solving the Problem] The image coding equipment concerning this invention is image coding equipment in which remote setting is free about two or more coding modes of different priority level about image quality and a motion, and is characterized by to establish a means detect that an input image is a still picture, and a coding means are not concerned with remote setting but encode an input image in the predetermined coding mode of image quality precedence according to the detection output of the detection means concerned.
[0010]
[Function] With the above-mentioned means, the above-mentioned coding means encodes without special actuation of a user the input image which is a still picture in the predetermined coding mode of image quality precedence. Thereby, a user's actuation burden is mitigated.
[0011]
[Example] Hereafter, the example of this invention is explained with reference to a drawing.
[0012] Drawing 1 is outline configuration block drawing of one example of this invention, and drawing 2 shows outline configuration block drawing of the image communication device incorporating this example.
[0013] First, drawing 2 is explained. The image input interface which the camera with which 10 photos a board participant, the paintings-and-calligraphic-works camera with which 12 photos records, such as a drawing, and 14 choose the output of cameras 10 and 12, and is changed into a predetermined content-type, the monitor which carries out image display of 16, and 18 are image output interfaces which supply a picture signal to a monitor 16.
[0014] As a monitor 16, two or more image display devices are sufficient even as an independent image display device, and you may be what can display two or more images on a separate window by the window system also with a still more independent image display device.
[0015] The selection composition circuit which 20 chooses and compounds an input image and a receiving image with cameras 10 and 12, and is supplied to the image output interface 18, and 22 are image coding decryption circuits which consist of image coding-network 22a which encodes the picture signal which should be transmitted, and image decryption circuit 22b which decrypts the received coded-image signal.
[0016] The hand set with which 24 consists of a microphone and a loudspeaker, and 26 are the voice-input/output interfaces to as opposed to [as opposed to / in a microphone and 28 / a loudspeaker] a hand set 24, a microphone 26, and a loudspeaker 28 in 30. The voice-input/output interface 30 not only switches the voice input/output of a hand set 24, a microphone 26, and a loudspeaker 28, but performs generation processing of tones, such as a dial tone, ringing tone, a busy tone, and a ringer tone, in echo cancellation processing and a list. 32 is a voice coding decryption circuit which consists of voice coding-network 32a which encodes the sound signal which should be transmitted, and voice decryption circuit 32b which decrypts the received coding sound signal.
[0017] 34 is a separation multiplexing circuit which separates coded-image information and coding speech information from the receipt information supplied from the circuit interface 34, and is supplied to image decryption circuit 22b and voice decryption circuit 32b, respectively while the circuit interface of a communication line (for example, ISDN circuit) and 36 multiplex the encoded information which should transmit from image coding-network 22a and voice coding-network 32a and it supplies them to the circuit interface 34.
[0018] The system control circuit where 38 controls the whole especially the image input interface 14, the image output interface 18, the selection composition circuit 20, the image coding decryption circuit 22, the voice-input/output interface 30, the voice coding decryption circuit 32, and the separation multiplexing circuit 36, and 39 are manual operating devices (for example, a ten key, a keyboard, etc.) for a user to input predetermined directions into the system control circuit 38.
[0019] The flow of the picture signal in the example shown in drawing 2 and a sound signal is explained briefly. The input image with a camera 10 and the paintings-and-calligraphic-works camera 12 is chosen with the image input interface 14, and one of these inputs it into the selection composition circuit 20.

The selection composition circuit 20 usually outputs an input image with cameras 10 and 12 to coding-network 22a of the image coding decoder circuit 22 as it is. Although image coding-network 22a is mentioned later for details, it encodes an input picture signal in the coding mode in which a control signal and internal decision are followed from the system control circuit 38, and outputs it to the separation multiplexing circuit 36.

[0020] On the other hand, the input sound signal with the microphone or microphone 26 of a hand set 24 is inputted into voice coding-network 32a of the voice coding decryption circuit 32 through the voice-input/output interface 30, and it encodes and it is impressed to the separation multiplexing circuit 36.

[0021] The separation multiplexing circuit 36 multiplexes the coded signal from coding networks 22a and 32a, and outputs it to the circuit interface 34. The circuit interface 34 outputs the signal from the separation multiplexing circuit 36 to the communication line to connect.

[0022] The signal received from the communication line is supplied to the separation multiplexing circuit 36 from the circuit interface 34. The separation multiplexing circuit 36 separates a coded-image signal and a coding sound signal from an input signal, and impresses them to image decryption circuit 22b and voice decryption circuit 32b, respectively. Image decryption circuit 22b decodes the coded-image signal from the separation multiplexing circuit 36, and impresses it to the selection composition circuit 20.

[0023] According to the control signal from the system control circuit 38, the selection composition circuit 20 carries out selection composition of the input image from the image input interface 14, and the receiving image from image decryption circuit 22b, and outputs them to the image output interface 18. The selection composition circuit 20 performs for example, a picture Inn picture, fitting to the response window in a window display system, etc. as synthetic processing. A picture monitor 16 carries out image display of the picture signal from the image output interface 18. Thereby, an input image and/or a receiving image are displayed on the screen of a monitor 16.

[0024] The receiving sound signal decoded by voice coding-network 32b is impressed to the loudspeaker and/or loudspeaker 28 of a hand set 24 through the voice-input/output interface 30. Thereby, the voice from a communications partner can be heard.

[0025] In addition, what transmits to a communications partner by commands other than an image and voice etc. is directly supplied to the separation multiplexing circuit 36 from the system control circuit 38, and the received command is directly supplied to the system control circuit 38 from the separation multiplexing circuit 36.

[0026] Next, drawing 1 is explained to a detail. Drawing 1 is equivalent to image coding-network 22a of drawing 2 . In addition, in this example, the INTER mode which encodes difference with a before frame (forecast) for every screen, and the INTRA mode encoded in the screen, without taking difference can be chosen. For example, in few images and still pictures of a motion or a motion in the direction of time amount, INTER mode is used and the big image of a motion and an image with few motions also use INTRA mode in the case of a scene change. Moreover, quantization step size is also changed according to the amount of coded data to generate, and it performs piece dropping (frame skip) as occasion demands.

[0027] In drawing 1 , the input terminal into which the pixel data from the selection composition circuit 20 input 40, and 42 are coding mode selection circuits which choose INTRA mode or INTER mode according to the energy comparison result and external-control signal between the prediction errors of the pixel value from an input terminal 40, and the pixel value concerned. In INTRA mode, the coding mode selection circuit 42 outputs the pixel value from an input terminal 40 as it is, and outputs difference (prediction error) with a forecast (before frame) in INTER mode per macro block which is the coding block.

[0028] The variable-length coding network to which 44 carries out the discrete cosine transform of the output of the coding mode-selection circuit 42, and the quantization circuit which quantizes the DCT multiplier data with which the DCT circuit which outputs DCT multiplier data, and 46 are outputted from the DCT circuit 44 in the specified quantization step size, and 48 carry out variable length coding of the output of the quantization circuit 46, the transmission buffer in which 50 buffers the output of a

variable-length coding network 48, and 52 are the output terminals which connect the output of a transmission buffer 50 to a separation multiplexing circuit 36.
[0029] The reverse quantization circuit where 54 carries out reverse quantization of the output of the quantization circuit 46, and 56 are reverse DCT circuits which carry out the reverse discrete cosine transform of the output of the reverse quantization circuit 54. 58 is an adder which adds and outputs a forecast to the output of the reverse DCT circuit 56 in INTER mode, and outputs the output of the reverse DCT circuit 56 as it is in INTRA mode. 60 is a frame memory for motion compensation inter-frame prediction, and memorizes the output (local decode value) of an adder 58.
[0030] The motion compensation circuit which the motion vector detector which 62 compares the picture signal of a frame per macro block before being memorized by the picture signal and the frame memory 60 inputted from an input terminal 40, and detects a motion vector, and 64 make move the data of the before frame from a frame memory 60 in a screen per macro block according to the motion vector detected by the motion vector detector 62, and offsets a motion, and 66 are the low pass filters which filter the output of the motion compensation circuit 64 per macro block. The output of a filter 66 becomes the forecast of inter-frame prediction, and is impressed to an adder 58 and a subtractor 68. A subtractor 68 computes the prediction error of the pixel data from an input terminal 40, and the output (forecast) of a filter 66, and supplies it to the coding mode selection circuit 42.
[0031] As for 70, the paintings-and-calligraphic-works camera selection detector where the system control circuit 38 detects having chosen the input image which carries out image transmission according to the paintings-and-calligraphic-works camera 12 as an image, and 72 are image coding control circuits which mainly control the coding mode selection circuit 42, the quantization circuit 46, the variable-length coding network 48, and a transmission buffer 50 according to the detection output of the control signal about coding from the system control circuit 38, and the paintings-and-calligraphic-works camera selection detector 70, and the buffer accumulated dose signal from a transmission buffer 50. There is a signal which specifies whether they are image quality (space resolution) precedence, motion flattery nature (time amount resolution) precedence, or such medium in the control signal about coding from the system control circuit 38.
[0032] Actuation of drawing 1 is explained. Image data inputs into an input terminal 40 from the selection composition circuit 20 (drawing 1) in the common format (CIF or QCIF) which follows CCITT advice H.261, for example. The image data inputted into an input terminal 40 is impressed to the coding mode selection circuit 42, a subtractor 68, and the motion vector detector 62.
[0033] A subtractor 68 computes the difference (prediction error) of the pixel data from an input terminal 40, and the forecast outputted from a filter 66, and impresses it to the coding mode selection circuit 42. The coding mode selection circuit 42 carries out the energy comparison of the pixel value from an input terminal 40, and the prediction error from a subtractor 68, and chooses coding mode according to the control signal from the comparison result and the image coding control circuit 72. And in INTRA mode, the input pixel value from an input terminal 40 is outputted to the DCT circuit 44 as it is, and the prediction error from the pixel value and subtractor 68 from an input terminal 40 is outputted to the DCT circuit 44 in INTER mode.
[0034] The DCT circuit 44 carries out discrete cosine (DCT) conversion of the data from the coding mode selection circuit 42 per block, and outputs DCT multiplier data to the quantization circuit 46. The quantization circuit 46 is the quantization step size specified by the quantization property control signal from the image coding control circuit 72, and quantizes the DCT multiplier data from the DCT circuit 44. The variable-length coding network 48 judges a significant block according to the coding control signal from the image coding control circuit 72, and carries out variable length coding of the quantization DCT multiplier according to CCITT advice H.261.
[0035] A transmission buffer 50 transmits a buffer accumulated dose to the image coding control circuit 72 while it buffers the variable-length coded data based on the variable-length coding network 48 and outputs it to the separation multiplexing circuit 36 through an output terminal 52. An error correcting code-ized circuit may be connected between a transmission buffer 50 and an output terminal 52.
[0036] The reverse quantization circuit 54 is the same quantization step size as having been chosen in

the quantization circuit 46, carries out reverse quantization of the output of the quantization circuit 46, and outputs the central value of a DCT multiplier. The reverse DCT circuit 56 carries out the reverse discrete cosine transform of the output of the reverse quantization circuit 56. An adder 58 adds a forecast (output of a filter 66) to the output of the reverse DCT circuit 56 in INTER mode, and outputs the output of the reverse DCT circuit 56 as it is in INTRA mode. The output of an adder 58 is stored in a frame memory 60.

[0037] A frame memory 60 possesses the storage capacity for at least two frames, and memorizes the output pixel value (namely, local decode value) of an adder 58. The motion vector detector 62 compares the pixel data of a frame, before being memorized from an input terminal 40 to the pixel data and the frame memory 60 of the present frame, and it detects a motion of an image. Specifically the pixel data of a before frame are read from a frame memory 60, a block matching operation is carried out by using near the macro block under processing of the present frame as a motion vector search window, and a motion vector is detected.

[0038] According to the motion vector detected in the motion vector detector 62, the motion compensation circuit 64 moves the pixel data of the before frame from a frame memory 60 in the direction of a screen so that the motion may be offset. Before the motion compensation of the filter 66 is carried out by the motion compensation circuit 64, it performs filter processing which eases the discontinuity in a block boundary to the pixel data of a frame, and it supplies processed data to a subtractor 68 and an adder 58 as a forecast.

[0039] If the paintings-and-calligraphic-works camera selection detector 70 is monitoring selection of the camera 10 by the system control circuit 38, or the paintings-and-calligraphic-works camera 12 continuously and selection of the paintings-and-calligraphic-works camera 12 is detected, it will output a detecting signal to the image coding control circuit 72.

[0040] The image coding control circuit 72 controls image coding at large according to the image quality control signal of user setting out from the system control circuit 38, the amount of data accumulation of a transmission buffer 50, and the detection output of the paintings-and-calligraphic-works camera selection detector 70. Specifically, it controls the quantization step size of the quantization circuit 46, the mode selection in the coding mode selection circuit 42, the significant block judging in the variable-length coding network 48, and piece dropping (frame skip) accommodative based on the amount of data accumulation of a transmission buffer 50 according to change of an input image, a scene change, and image quality setting out of an operator so that a transmission buffer 50 does not overflow.

[0041] In addition, since the present frame and the before frame are dramatically alike, the image with little a motion and change is using the INTER mode which encodes difference with a before frame, and can reduce the time redundancy. On the other hand, since inter-frame correlation is small in the case of an image with a large motion, or a scene change, the INTRA mode encoded within the same frame is used.

[0042] Image quality improves so that quantization step size is made small, as the quantization property was explained previously, but since significant data increase, it leads to the increment in the number of transmitted bits. On the other hand, although the transmission amount of data will decrease if quantization step size is made [many], image quality deteriorates. Then, the amount of data accumulation of a transmission buffer 50 is monitored continuously, and quantization step size is set up efficiently suitably. Moreover, piece dropping (frame skip) processing is performed according to the coding number of bits to generate, and a frame rate is adjusted.

[0043] The property of an input image can be judged besides the energy comparison with the input value and prediction incorrect difference value in the coding mode selection circuit 42 also by selection and a scene change of the paintings-and-calligraphic-works camera 12 of an input image. A scene change is detectable with the rate of a selection ratio in for example, INTRA mode etc.

[0044] With reference to the flow chart shown in drawing 3 , actuation of the image coding control circuit 72 to the detection output of the paintings-and-calligraphic-works camera selection detector 70 is explained. First, the output of the paintings-and-calligraphic-works camera selection detector 70 is investigated (S1). And when the paintings-and-calligraphic-works camera 12 is chosen, it is not

concerned with setting out of a user, but the image processing in an image quality priority mode, i.e., image coding, is performed (S6).

[0045] When the paintings-and-calligraphic-works camera 12 is not chosen, the image quality control signal of user setting out from (S1) and the system control circuit 38 A canonical mode, It investigates any of a motion priority mode or an image quality priority mode they are (2 S 3). At the time of a canonical mode, an image processing is carried out by (S2) and the canonical mode, an image processing is carried out by (S3) and the motion priority mode at the time of (S4) and a motion priority mode (S5), and an image processing is carried out by (S3) and the image quality priority mode at the time of an image quality priority mode (S6).

[0046] Thus, in this example, according to the detection result of the paintings-and-calligraphic-works camera selection detector 70, it is not concerned with setting out of a user, but image quality precedence is encoded. In addition, it cannot be overemphasized that the coding mode of dedication of image quality precedence may be formed in transmission of the input image of a paintings-and-calligraphic-works camera.

[0047]

[Effect of the Invention] Since still pictures, such as a graphic form and a graph, are encoded without special actuation of a user by image quality precedence according to this invention so that he can understand easily from the above explanation, a user's actuation burden is mitigated.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is outline configuration block drawing of one example of this invention.
[Drawing 2] It is outline configuration block drawing of the pictorial communication equipment incorporating this example.
[Drawing 3] It is the operation flow chart of this example.
[Description of Notations]
10: Camera 12: Paintings-and-calligraphic-works camera 14: Image input interface 16: Monitor 18: Image output interface 20: Selection composition circuit 22: Image coding decryption circuit 22a: Image coding network 22b: Image decryption circuit 24: Hand set 26: Microphone 28: Loudspeaker 30: Voice-input/output interface
32: voice coding decryption circuit 50:transmission-buffer 52: -- an output terminal -- 54:reverse quantization circuit 56:reverse DCT circuit 58: -- an adder A 32 a:voice coding network A 32 b:voice decryption circuit A 34:circuit interface A 36:separation multiplexing circuit A 38:system control circuit 39: -- a manual operating device 40: -- input terminal 42:coding mode-selection circuit 44:DCT circuit 46:quantization circuit 48:variable-length coding network
60: Frame memory for motion compensations 62: Motion vector detector 64: Motion compensation circuit 66: Low pass filter 68: Subtractor 70: Paintings-and-calligraphic-works camera selection detector 72: Image coding control circuit

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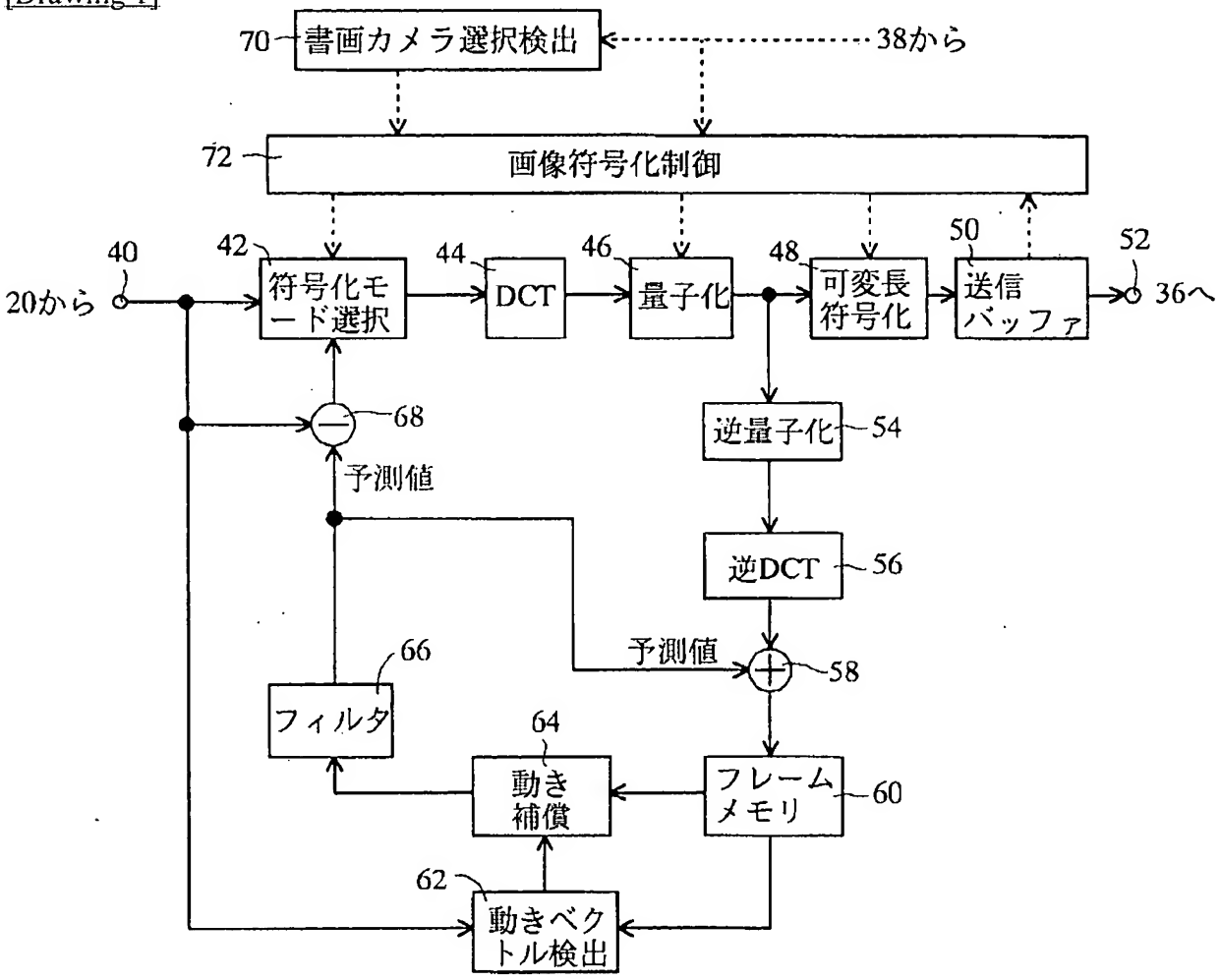
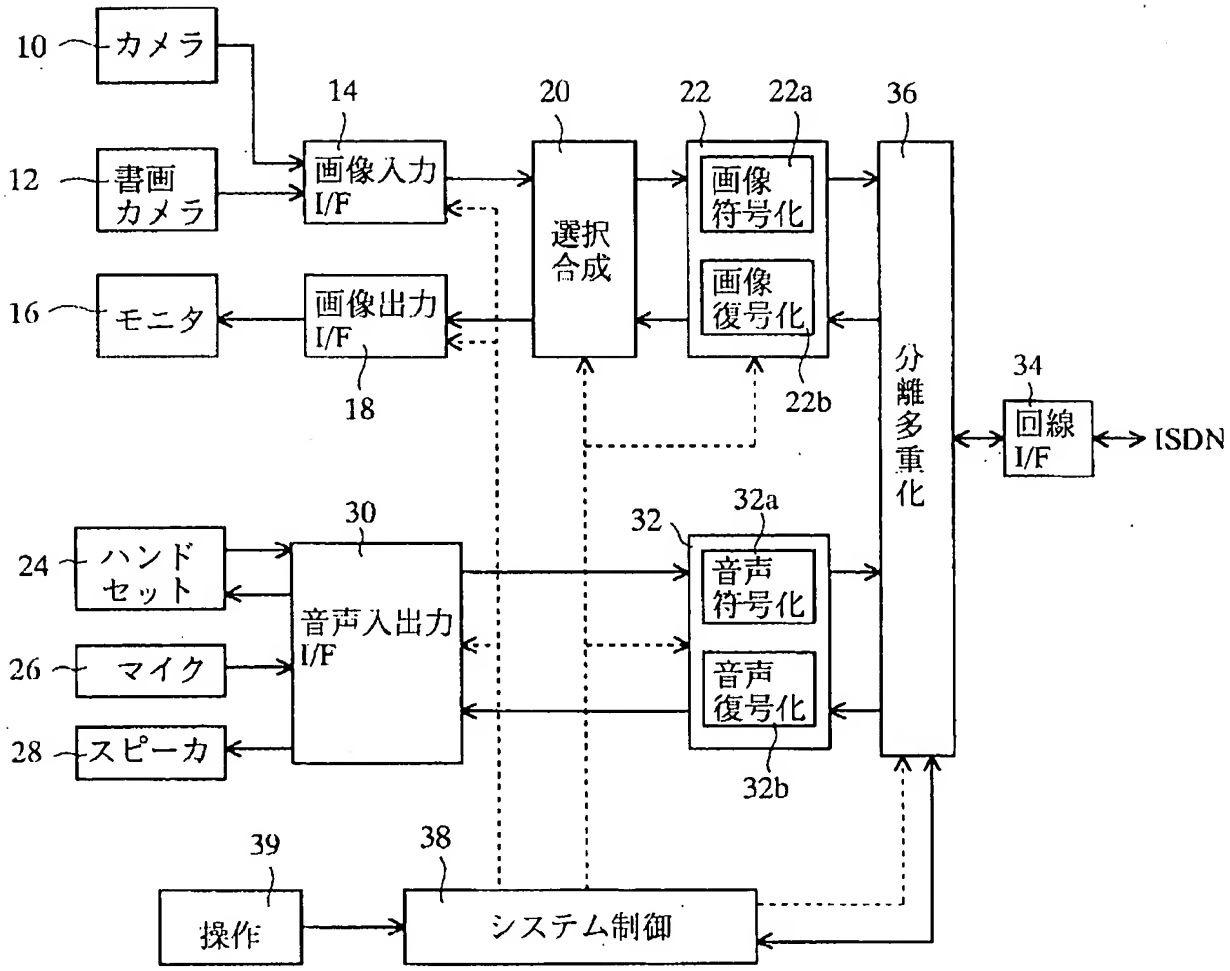
DRAWINGS

[Drawing 1]



[Drawing 2]


10
カメラ
12
書画
カメラ
14
画像入力
I/F
20
選択
合成
22
22a
画像
符号化
画像
復号化
22b
36
分離多重化
34
回線
I/F
ISDN
16
モニタ
画像出力
I/F
18
30
24
ハンド
セット
音声入出力
I/F
26
マイク
28
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音声
復号化
32b
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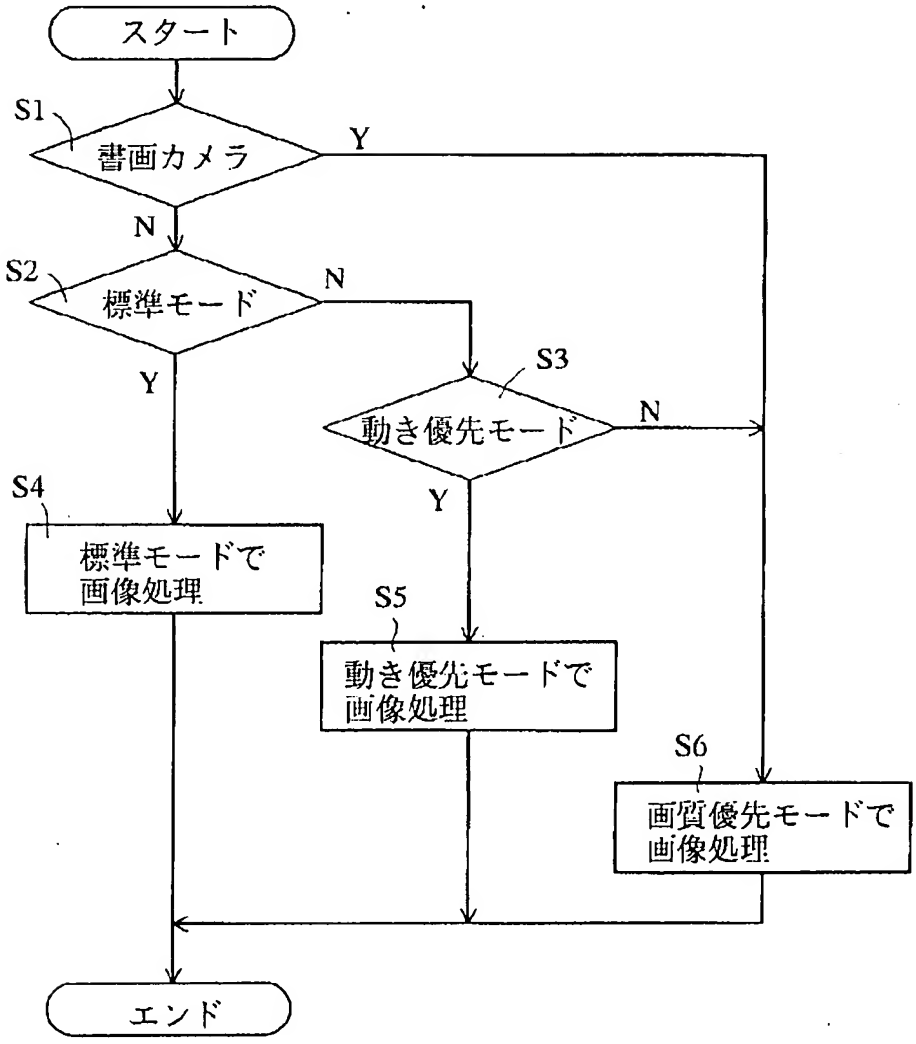
操作
38
システム制御

[Drawing 3]



[Translation done.]